

CHALLENGE ROTH 2023

# CDAM Testing

## Overview

As a part of Swiss Side's presence at Challenge Roth 2023, we measured the conditions on the bike course for the duration of one lap. The intention is to propose a competition setup for athletes of all kinds, based on the current and anticipated conditions on the original course of Challenge Roth 2023. By using the Swiss Side CDAMeter (CDAM = Coefficient of Drag Area in Square Meters) it is possible to measure the aerodynamic drag during cycling outdoors.

## The Course

The ride was one loop of the bike course, including the start/end road:

- Total distance: 93.67 km
- Elevation gain: 721 m

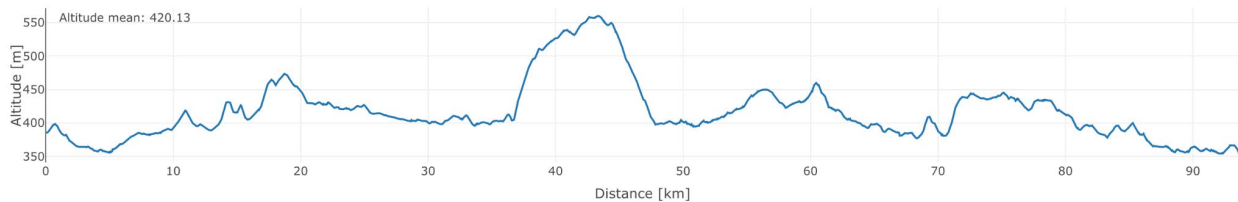


Figure 1: Elevation profile of one lap of Challenge Roth 2023 bike course.

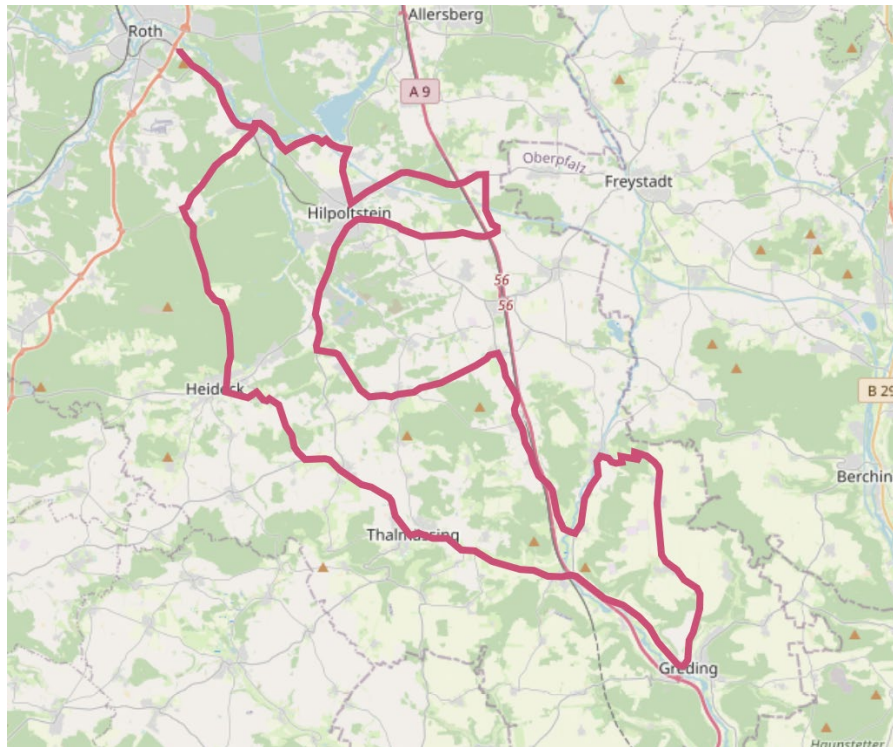


Figure 2: Map of the bike course of Challenge Roth 2023.

## Test Configuration

- Bike: Fuji Norcom Straight
- Wheels: Swiss Side Hadron Ultimate 800 front and rear
- Tires: Continental 5000 - 23mm front and 25mm rear
- Cloth: Swiss Side cycling jersey
- Calves: Swiss Side AERO CALF Sleeves and shaved legs (50/50% of the course)



Figure 3: CDA meter for aero measurement

## Ride summary and forecast

Test ride:

- Rider: 178 cm, 66 kg
- Distance: 93.67 km
- Elevation gain: 721 m
- Avg. Speed: 35.7 km/h
- Avg. Power: 203 W

## Wheelset recommendations – Friday 23/06/2023 windy conditions

As mentioned above the test rider rode with the Swiss Side Hadron 800 rim brake wheels. In today's conditions the handling with the 800 wheelset in TT position was reported to be challenging at times, especially in wind gusts where the steering was reported to be a little twitchy and it was noted that good bike handling skills are required to ride the 800s in such conditions.

In these conditions, the test rider would recommend choosing a Hadron 625 front wheel, or for very light riders even a Hadron 500 front wheel. For the rear wheel the test rider would always go for a Hadron 800 wheel, because it does not influence stability as much as the front wheel and gives maximum performance in terms of aerodynamics.

Road conditions on the course are overall very good. Therefore, it is recommended to go for higher pressures ranging from around 6 to 7,5 bars, depending on tyre width and bike and rider weight.

## Wheelset recommendations - Race day 25/06/2023 wind condition forecast

Currently, the prediction for race day is a light wind of around 10 km/h from the east, so both a significant reduction in wind speed and a flipping of the direction. Therefore, it will be much easier conditions and it makes sense to go for the most aerodynamic wheel combination:

- Front: Swiss Side Hadron 800
- Rear: Swiss Side Hadron 800 or Swiss Side Hadron DISC

## AERO CALF Sleeves analysis

Over the test ride the test rider changed from no calf socks to calf socks every 15 km. Using the CDAM system the data was then processed to come up with an average  $C_dA$  number for with and without calf socks.

To have a fair comparison between the different 15 km stretches the data was filtered to only include points matching the following criteria:

- Speed above 30 km/h
- Slope between  $\pm 3\%$

The following plot shows the  $C_dA$  over the course and the sections used for comparing with and without calf socks:

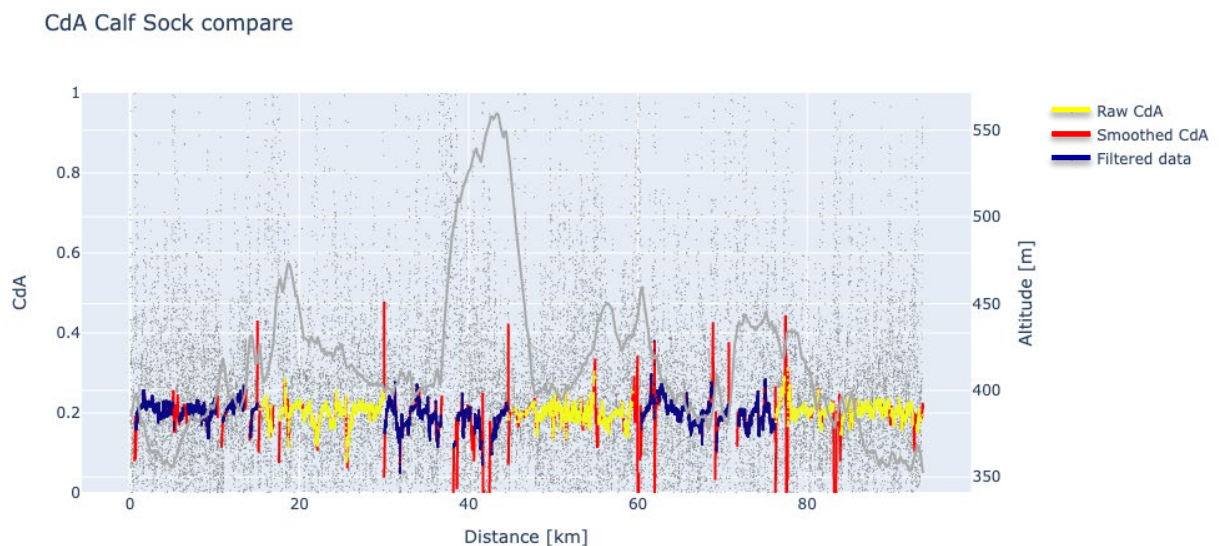


Figure 4: CdA and elevation data plot













Taking the averages of the data we get:

- No socks: 0.210 m<sup>2</sup>
- Calf socks: 0.207 m<sup>2</sup>

That is a 1.4 W saving at the average speed of the ride (35.7 km/h) and 4.3 W saving at a speed of 45 km/h.

# Wind condition summary - Friday 23/06/23

Weather as reported by meteoblue®:

Friday	03 <sup>00</sup>	06 <sup>00</sup>	09 <sup>00</sup>	12 <sup>00</sup>	15 <sup>00</sup>	18 <sup>00</sup>	21 <sup>00</sup>	00 <sup>00</sup>
 Temperature (°C)	 18°	 18°	 18°	 18°	 18°	 17°	 15°	 13°
 Temperature felt (°C)	18°	16°	14°	13°	13°	12°	14°	12°
 Wind direction	↗ WSW	→ W	→ W	→ W	↙ WNW	↙ NW	↙ NW	→ W
 Wind speed (km/h)	16-22	18-31	23-45	25-48	<b>23-47</b>	25-34	10-21	5-13

These conditions are very windy, this can be seen in the CDAM data. Following is the yaw angle distribution, it shows that over the course the time spent at higher yaw angles is significant.

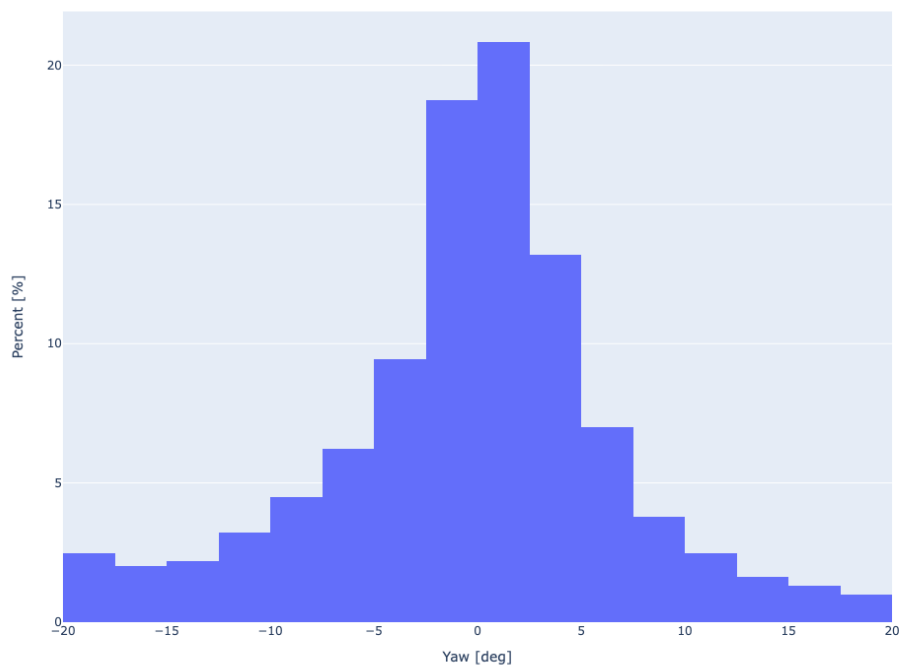


Figure 5: Yaw angle distribution.

The time spent in headwind and tailwind is similar (which is to be expected) as can be seen on the following plot, again with the percent of time spent on the Y axis:

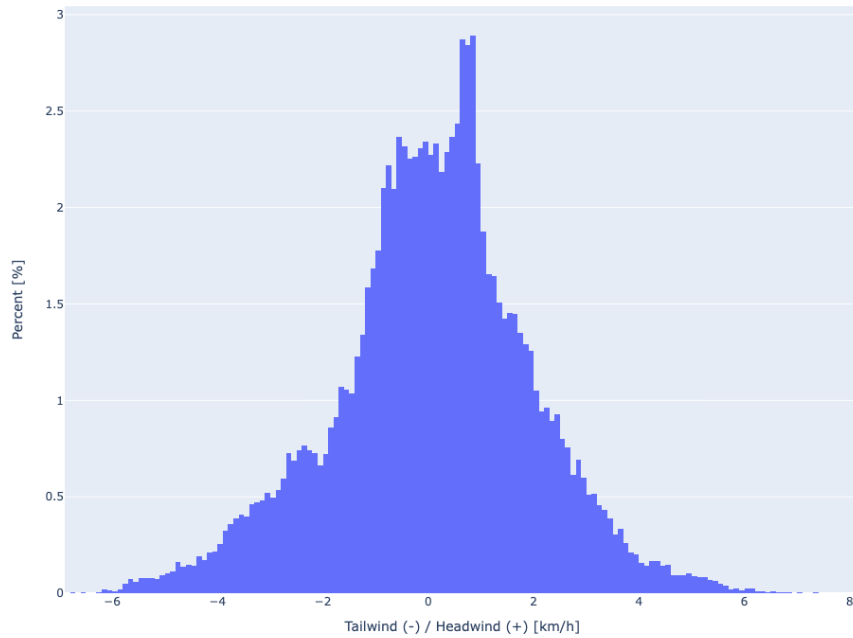


Figure 6: Headwind (+) / tailwind(-) distribution.

Visualizing this on the course we see a strong tailwind section on the eastwards section of the loop, matched with an equally strong headwind section heading back.

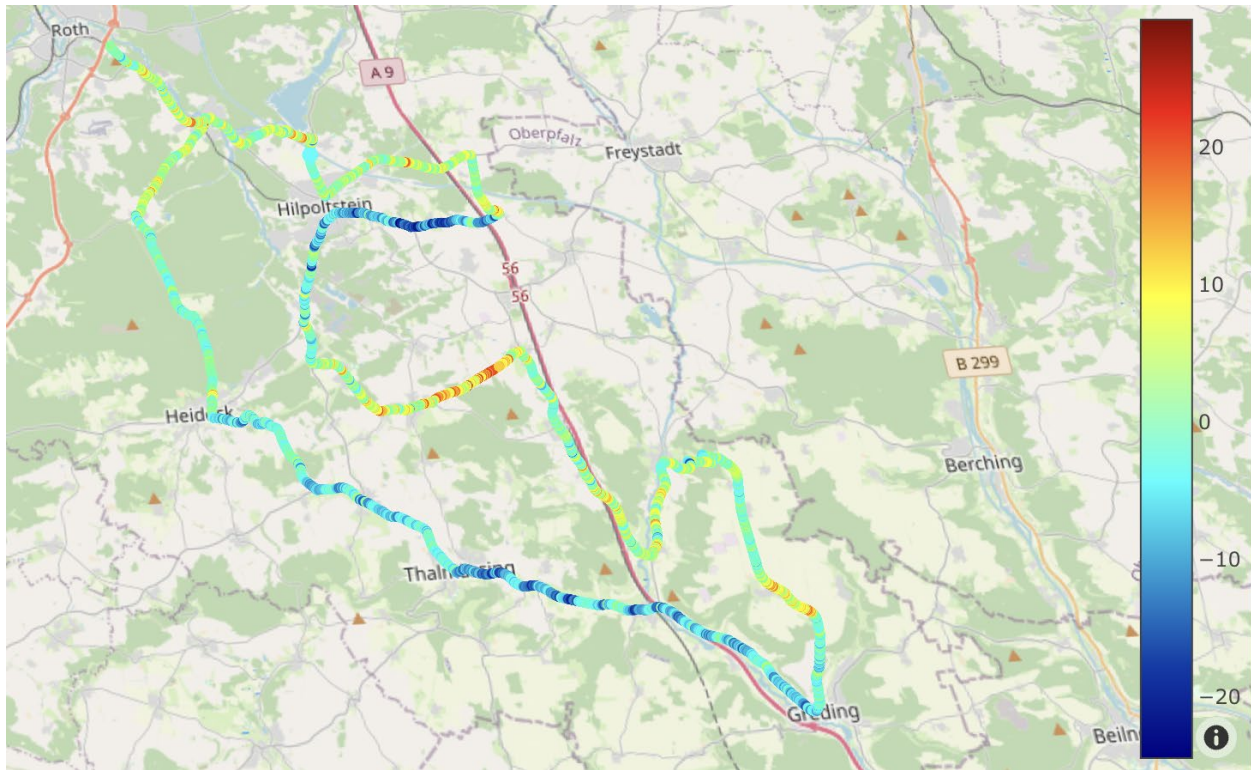


Figure 7: Visualization of tailwind (blue) and headwind (red)

Looking at the static wind speed we see gusts up to 35 km/h:

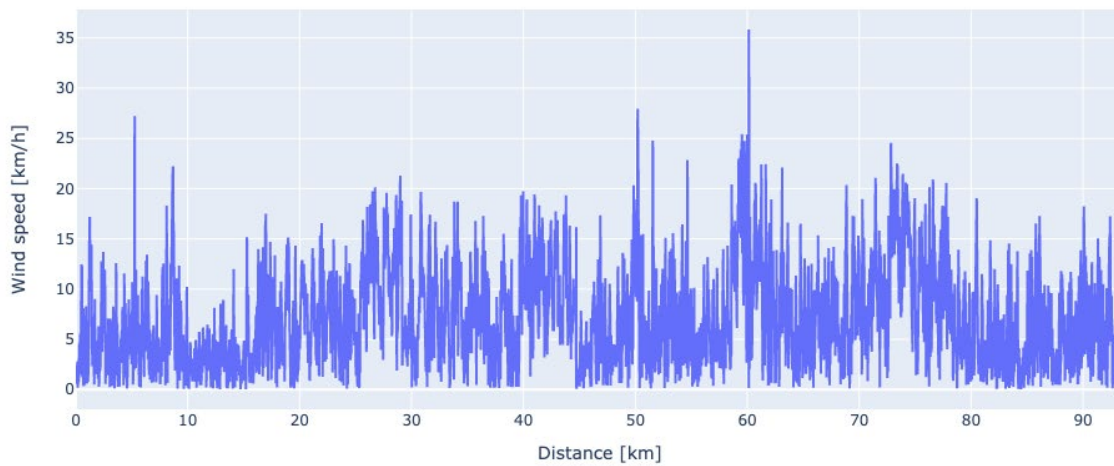


Figure 8: Wind speed (static)